

US EPA ARCHIVE DOCUMENT

Program Office Perspective: Thoracic Coarse Particles



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Overview

- Basis for current standards (proposed vs. final decisions)
- Revised NAAQS review process
- Current PM NAAQS review
 - Key policy-relevant issues
 - Completed/ongoing activities
 - Schedule

Current PM NAAQS

	2006 Standards	
	Annual	24-hour
PM_{2.5}	15 µg/m³ Annual average	35 µg/m³ 98 th percentile
PM₁₀	Revoked	150 µg/m³ 1 expected exceedance

Summary of Data Available in Last Review

- Health effects evidence
 - Dosimetry data showed deposition of coarse particles in sensitive regions of the lung
 - Toxicology data showed potential mechanisms for coarse particles, or components, to affect respiratory system
 - Epidemiology data showed evidence of effects from short-term exposure to $PM_{10-2.5}$, with supportive evidence from PM_{10} studies where coarse fraction predominates
- Health risks estimated to occur in areas that did not meet current PM_{10} standards; reasonably judged to be important from a public health perspective
- CASAC unanimously recommended a standard targeted to address particles between 2.5 and 10 μm

Risk Assessment Conducted for Last Review

- Scope of quantitative risk assessment (QRA) conducted for $PM_{10-2.5}$ much more limited than QRA for $PM_{2.5}$
 - 3 urban areas (Detroit, Seattle, St. Louis) and
 - 2 categories of health endpoints
 - Hospital admissions for cardiovascular and respiratory causes
 - Respiratory symptoms
- Staff judged QRA too limited to provide an appropriate basis for selecting level of standard for thoracic coarse particles

Thoracic Coarse PM: Proposed Approach in '06

- Sufficient information was available to develop indicator for coarse particles based on the size fraction from 10 to 2.5 μm to replace PM_{10} indicator
- Most obvious choice was size-differentiated, mass-based indicator used in epi studies that provided most direct evidence of health effects: $\text{PM}_{10-2.5}$
 - Insufficient information available to define an indicator solely in terms of other metrics, such as specific chemical components
- Health effects evidence largely drawn from studies conducted in urban environments; largely an absence of evidence related to coarse particles typical of non-urban areas
- CASAC advised, and EPA pursued, an indicator that would focus regulation on urban-type coarse particles
 - Because evidence was insufficient to support compositionally based indicator, EPA focused instead on coarse particles associated with sources typical of urban environments, including high-density traffic on paved roads and industrial and construction sources

Thoracic Coarse PM: Proposed Decision '06 – 24-Hr Standard

- Proposed qualified PM_{10-2.5} indicator to focus on particles of concern:
 - Included “any ambient mix of PM_{10-2.5} dominated by resuspended dust from high-density traffic on paved roads and PM generated by industrial sources and construction sources”
 - Excluded “any ambient mix of PM_{10-2.5} dominated by rural windblown dust and soils and PM generated by agricultural and mining sources”
 - Also stated that “Agricultural sources, mining sources, and other similar sources of crustal material shall not be subject to control in meeting this standard”
- Proposed site suitability requirements for NAAQS-comparable monitors (“5-point test”)
 - Urbanized Area with population >100,000;
 - Population density of block group > 500 (highly correlated with VMT; “may be” associated with industrial and construction sources);
 - Population-oriented monitoring site;
 - Not within micro-scale environment affected by a large source; and
 - Affirmative showing that mix within an area meeting above criteria is dominated by sources of concern

Thoracic Coarse PM: Final Decision '06 - 24-hr Standard

- Retained existing 24-hour PM_{10} standard of $150 \mu\text{g}/\text{m}^3$ (first set in 1987)
- Problems with proposed “qualified” $PM_{10-2.5}$ indicator:
 - Inability to identify which particles were included/excluded
 - Proposed indicator failed to provide uniform national protection from particles of concern because of monitoring site suitability criteria
 - Evidence linked coarse particles in *urban areas* to adverse health effects, but was *inconclusive* regarding effects of thoracic coarse particles in *rural areas*
- PM_{10} indicator determined to be more effective in targeting protection than other options
 - Inclusion of $PM_{2.5}$ provides variation in allowable $PM_{10-2.5}$ concentrations, allowing lower levels where concern is greater
 - “Double regulation” of $PM_{2.5}$ serves a valid purpose
 - Important to provide some protection from all thoracic coarse particles while targeting protection at urban and industrial mixes
 - Ensures inclusion of all ambient mixes of known concern; potential that research may reveal risks of non-urban or rural mixes

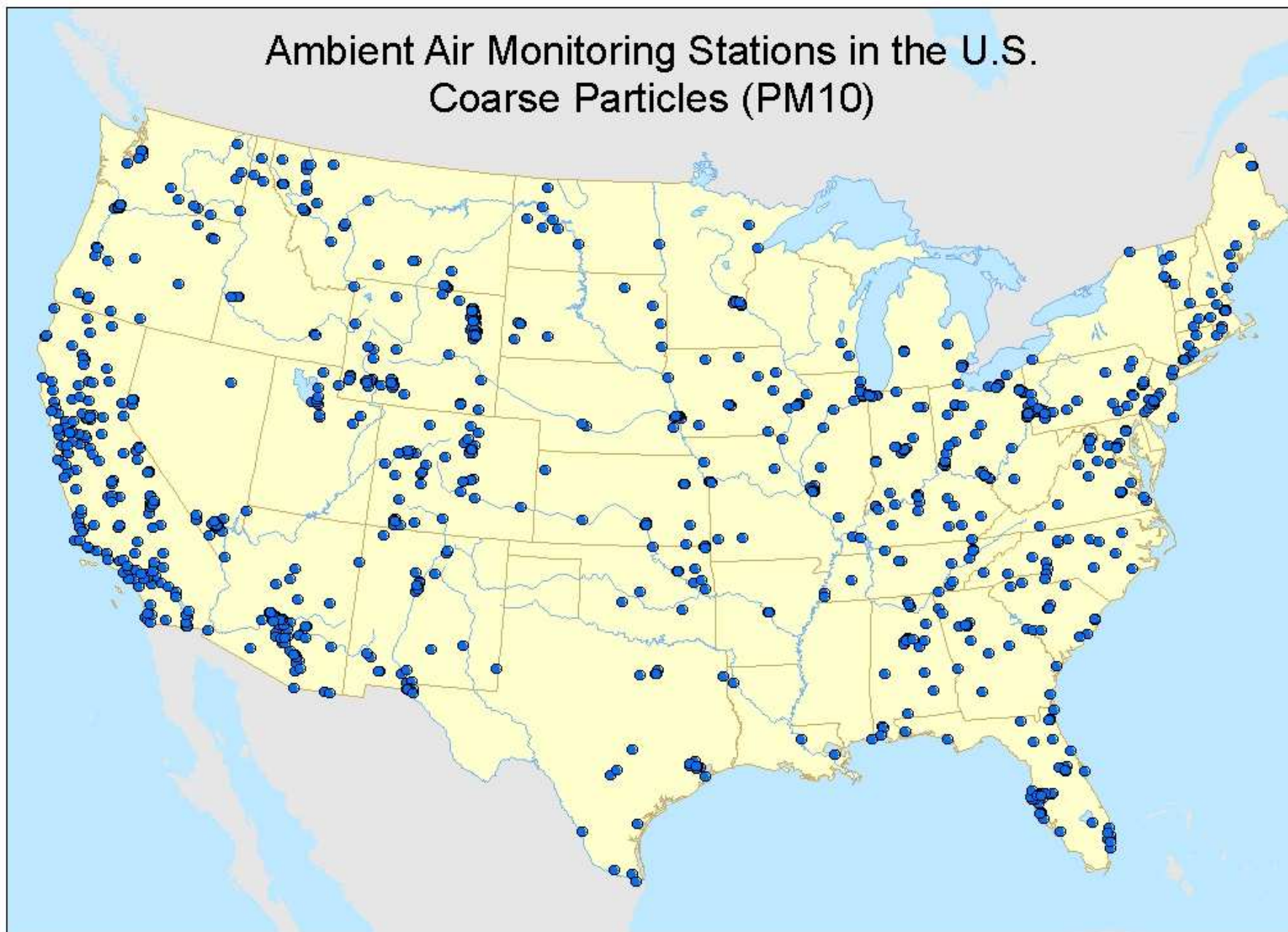
Thoracic Coarse PM: '06 – Annual Standard

- Proposed and finalized revocation of PM₁₀ annual standard
 - Available evidence did not suggest a link between long-term exposure to PM₁₀ at current ambient levels and health problems
 - Analysis of air quality data showed that the 24-hour PM₁₀ standards generally resulted in annual average PM₁₀ levels at or below the level of the former annual standard of 50 µg/m³

PM_{10-2.5} Monitoring Network Requirements

- New PM_{10-2.5} Federal Reference Method (FRM) promulgated in '06
 - To support health research studies
 - To provide a basis for Federal Equivalent Methods (FEMs)
- Coarse particle measurements will be required at 75 NCore locations starting on Jan 1, '11
 - Measuring multi-pollutants in addition to coarse particles
 - ~55 Urban Sites at Neighborhood to Urban Scale
 - ~20 Rural Sites at Regional Scale
 - 1 in 3 day sampling
 - ~25 sites will measure coarse particle components

Ambient Air Monitoring Stations in the U.S. Coarse Particles (PM10)



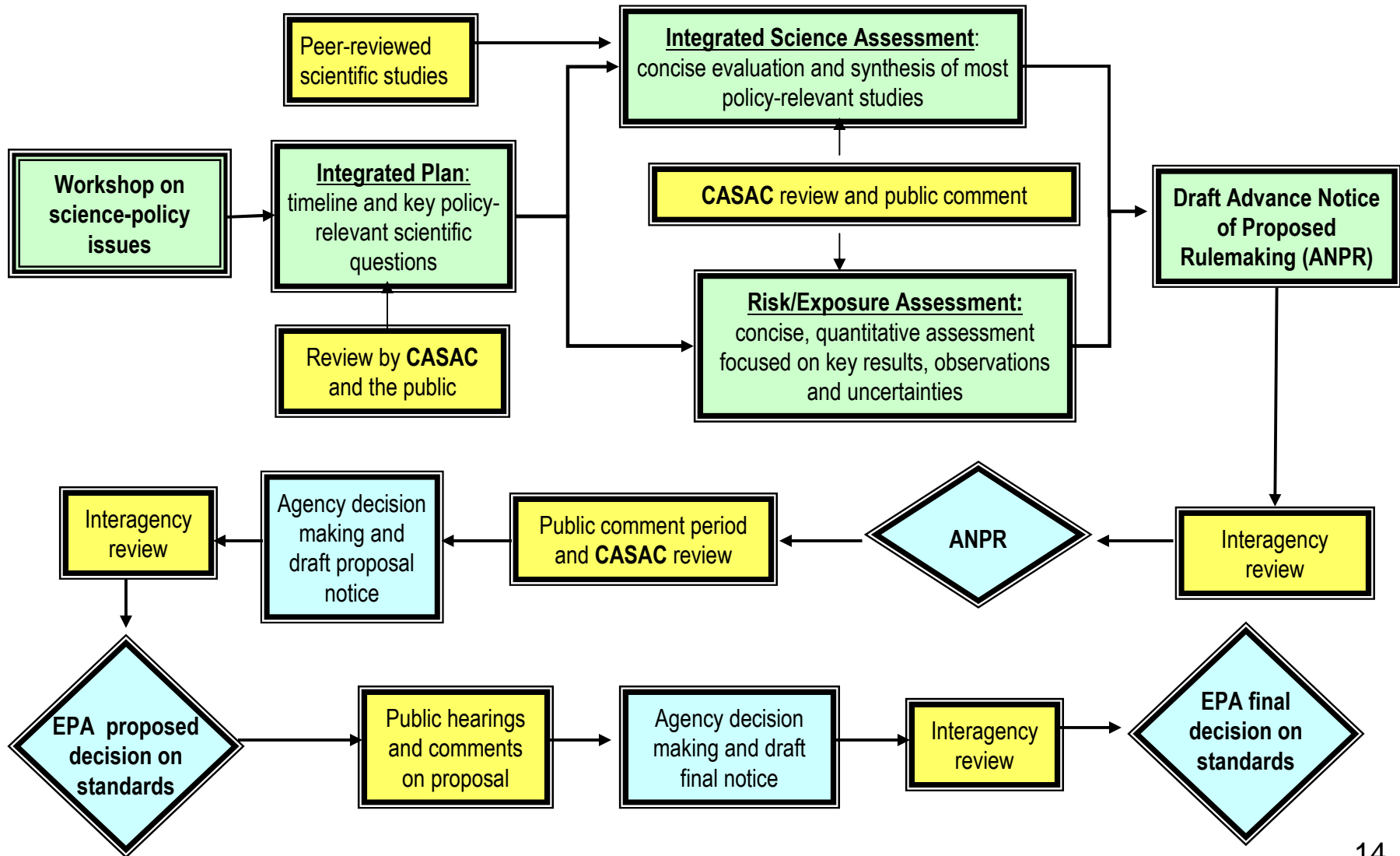
Potential NCORE Sites



Revised NAAQS Process: Key Steps

- **Planning:**
 - Receive early input from experts, including CASAC
 - Focus efforts on key policy-relevant issues and science that informs our understanding of these issues
 - Create one integrated plan early in process
- **Integrated Science Assessment**
 - Replace voluminous Criteria Document with more concise synthesis of most policy-relevant science accompanied by extensive Annexes
 - Develop continuous survey/evaluation of new science; create state-of-the-art electronic databases to catalog new studies
- **Risk/Exposure Assessment**
 - Create more concise document in parallel with development of ISA
 - Emphasize key results, observations and uncertainties
- **Policy Assessment/Rulemaking**
 - Develop policy assessment which will present Agency views

NAAQS Review Process





Current PM NAAQS Review

- Overarching questions in primary NAAQS review
 - In light of newly available information, are current standards requisite to protect public health with an adequate margin of safety?
 - If not, what revisions are appropriate in terms of *indicator*, *averaging time*, *level* and *form*?
- Framework for current review
 - Building on the last review, the evaluation of the available scientific evidence will be based on particle size, considering fine and coarse-fraction particles separately
 - Evidence for additional size fractions (e.g., ultrafines) will also be considered
 - Within this basic structure, evidence on specific *components*, *sources*, and *environments* (e.g. urban/non-urban areas) will be evaluated
 - Update and expand quantitative risk assessment

Key Policy-Relevant Questions for Current Review

Sources/Environments

- What factors influence the variability of $PM_{10-2.5}$ mass and composition between locations (including rural & urban differences)?
- Are thoracic coarse particles found in urban and/or rural areas associated with adverse health effects?
- Does the type of health outcome and the magnitude of estimated risk differ between rural and urban areas?
- Do source and compositional differences of $PM_{10-2.5}$ affect the type and severity of health outcomes?

Sensitive/Vulnerable Populations

- Are there specific subpopulations that are more sensitive to $PM_{10-2.5}$ exposures? If so, what are the characteristics of these subpopulations (e.g., age, ethnic group, SES)?
- Do differences in $PM_{10-2.5}$ components/sources/environments affect who is susceptible to adverse health outcomes?

Risk/Exposure Considerations

- How do $PM_{10-2.5}$ exposures vary spatially and temporally?
- What is the impact of exposure measurement error on effect estimates?

Key PM_{10-2.5} Monitoring Issues for Current Review

Network Design

- What factors should be considered in identifying the number of monitors and geographic distribution of monitors in a PM_{10-2.5} network?
- What additional sampling and statistical techniques are available to help determine the minimum number of monitors needed to assess spatial and temporal variability?
- What are the appropriate monitor placement criteria (distance relative to sources, measurement scale, and inlet height)? Should data from monitors located nearly adjacent to sources be excluded from comparison with a potential NAAQS?

Monitoring Methods

- What new information is available to inform options and technologies for sampling and analysis of components of thoracic coarse particles?
 - Currently the difference and dichot methods are being used. What other sampling methods or technologies are available and appropriate for collecting PM_{10-2.5}?
 - Do biological materials and fly ashes need to be measured and, if so, how should they be collected and analyzed?

Current PM NAAQS Review: Completed Activities

- PM: first review following revised NAAQS process from start to finish
- Initial planning workshops – July '07
- Integrated Review Plan (IRP)- finalized Mar '08
- Technical documents under development:
 - Integrated Science Assessment (ISA)
 - Authors' workshop to discuss preliminary draft ISA materials – June 16-17, '08
 - Submit 1st draft for CASAC/public review - Sept '08
 - Risk/Exposure Assessments
 - Submit draft Scope and Methods Plans for CASAC/public review – Oct '08
 - Next CASAC review – early Dec '08
- Studies published through early '09 will be considered in final ISA
- Additional risk/exposure assessment studies published through mid '09 may also be considered

Schedule for the PM NAAQS Review

(as of April 2008)

Major Milestones		Projected/Completed Date	Projected/Completed CASAC Review Date	
Workshops to Discuss Key Policy-Relevant Issues		July 2007		
Integrated Review Plan	Draft Final	October 2007 March 2008	November 30, 2007	
Integrated Science Assessment	First Draft Second Draft Final	September 2008 March 2009 September 2009	Early December 2008 May 2009	* <div></div>
Risk/Exposure Assessment	Draft Plan First Draft Second Draft Final	October 2008 April 2009 November 2009 March 2010	Early December 2008 May 2009 January 2010	
Policy Assessment/ Rulemaking	ANPR Proposed Final	June 2010 January 2011 October 2011	August 2010	

*Indicates that a single CASAC meeting will address both documents